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(56) Documents Cited:
US 4243343 A US 2218954 A
US 2218953 A

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(54) Abstract Title: Self adjusting fence panel

- (57) A fence 3 comprises at least two rails 5, at least one of which has holes therein which receive solid pales 1, the pales being attached to the rails by resiliently biased fastening means such as a pair of spring loaded lugs 9 which are slidably housed within a bore in each pale 1. The outer end 12 of each lug 9 is urged into a recess 7 in an internal wall 6 of the rail 5 so as to form a pivot which locks the pale 1 to the rail 5. The inner ends of the lugs 9 have a cavity containing the spring 10.
- A method of assembling a fence, as disclosed above, by sliding a sleeve(not shown) over the pale 1 so as to restrain the lugs 9, then withdrawing the sleeve as the pale 1 passes into the rail is also disclosed.

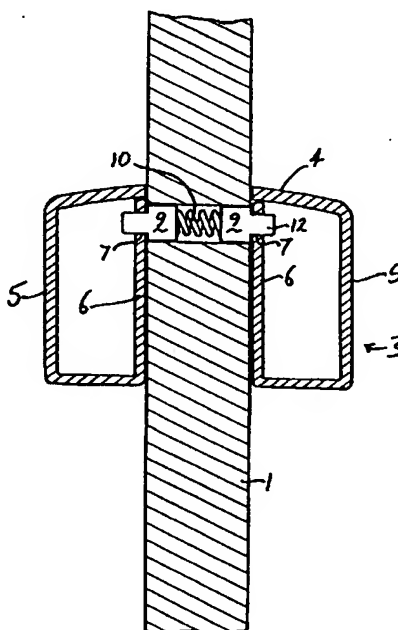


FIG. 2A

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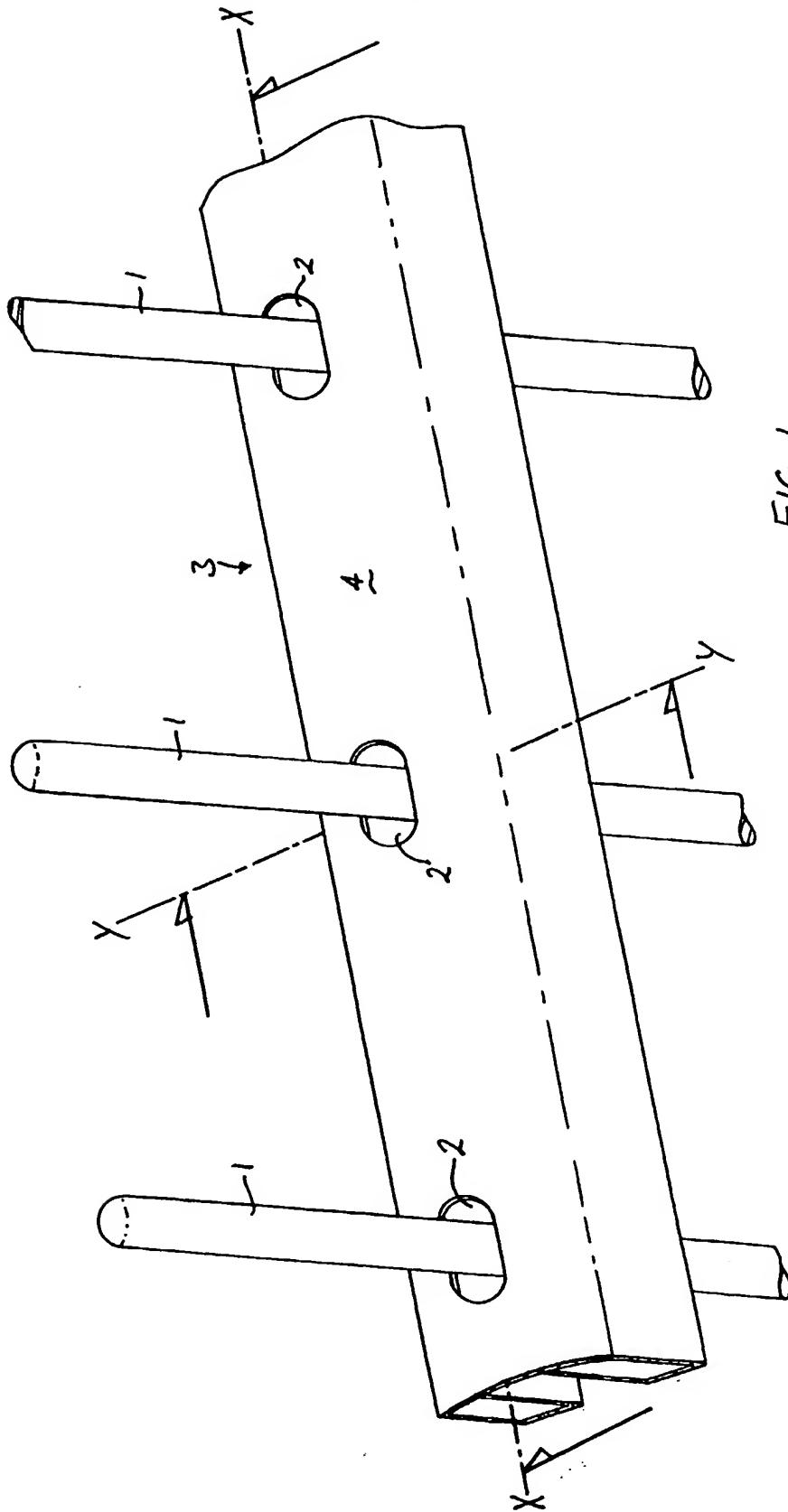


FIG. 1

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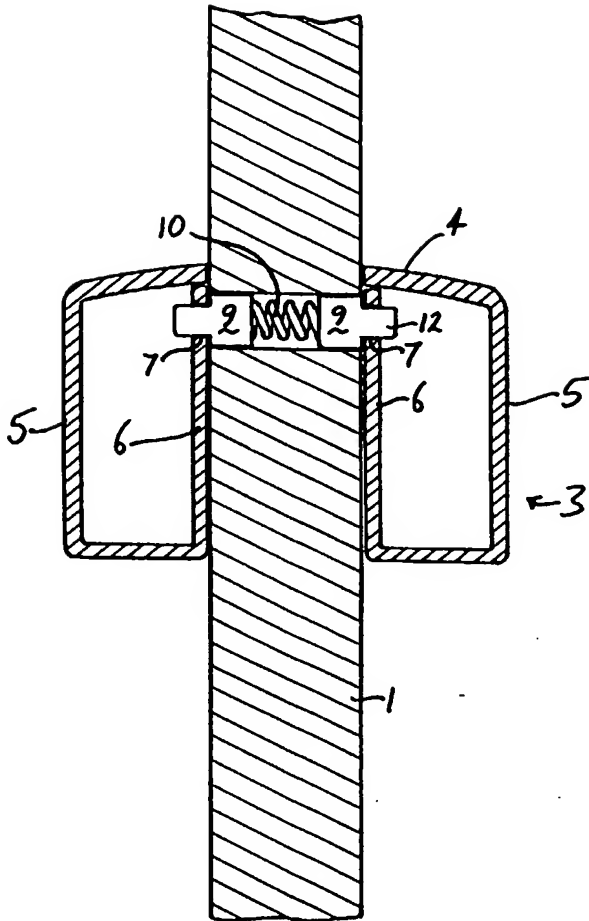


FIG. 2A

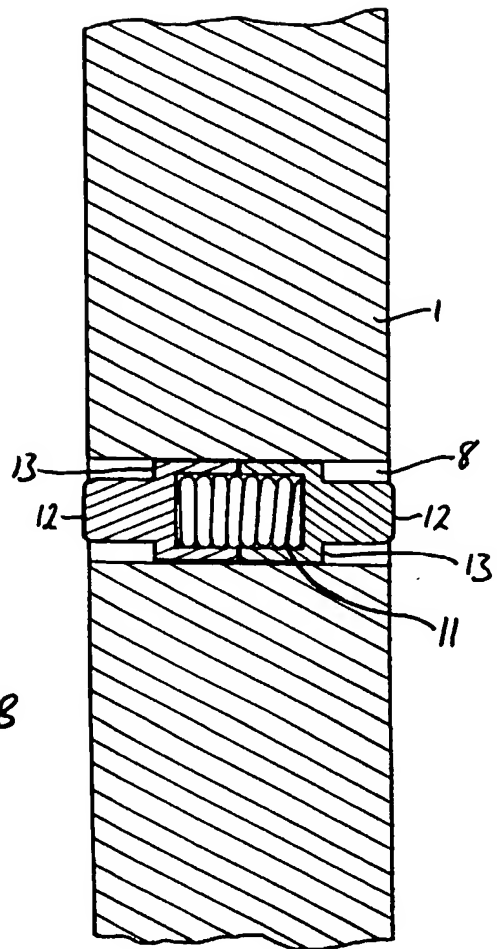


FIG. 2B

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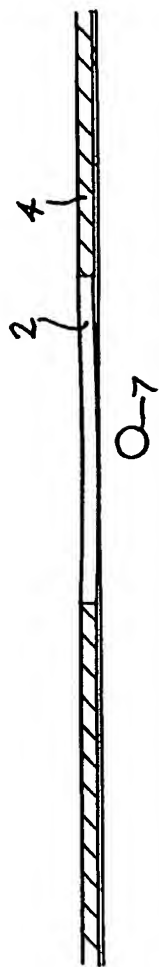


FIG. 2C

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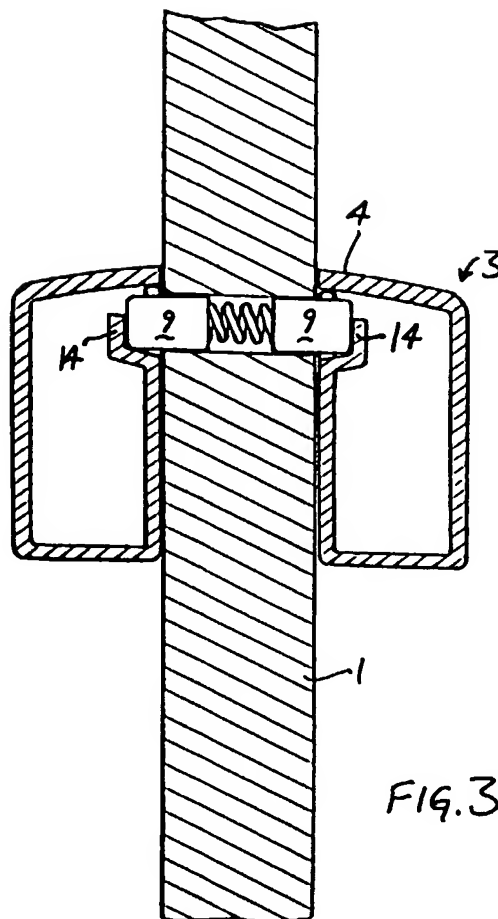


FIG. 3A

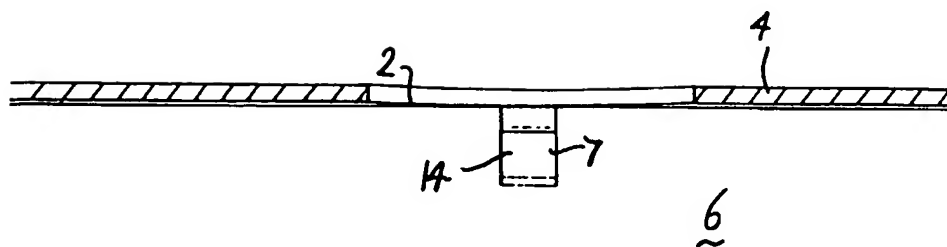


FIG. 3B

Self adjusting fence panel and method of assembly

This invention relates to self adjusting post-and-panel fences.

- 5 Self adjusting post-and-panel fences comprise a plurality of panels, each panel attached at its ends to a pair of vertical posts fixed in the ground, wherein each panel is adjustable during installation so that its lower edge follows the slope of the ground while its ends remain vertical. Commonly, each panel comprises at least two rails which support a plurality of generally vertical pales, each pale
10 being formed from a solid rod or bar or a hollow tube.

- Self adjusting post-and-panel fences wherein each panel is formed from rails and pales require the pales to be articulated to the rails to permit a range of angular adjustment therebetween. As the panel is adjusted to follow sloping ground it
15 assumes an increasingly skewed, parallelogrammatic form, with the pales and the ends of the panels remaining vertical. This enables the panel to be easily fixed in place by attaching the ends of the rails to the vertical posts, whilst avoiding the gaps which would necessarily be left under fixed, rectangular panels erected in a stepped configuration on sloping ground, and which would compromise the
20 security of the fence.

- It is advantageous that, in addition to being self adjusting, each panel should be capable of being easily assembled from its component rails and pales on site, reducing the cost of manufacture, transport and assembly. It has long been known
25 to assemble solid pales, each formed from a round section steel rod, into oversize apertures in the rails, and afterwards to locally deform each rod so as to retain it adjustably to the rails. However, this system requires that each panel should be assembled at a factory, or otherwise that heavy and specialist tools should be brought on site.

Various alternative constructions have been proposed facilitating on-site assembly of self adjusting panels. For example, GB 2 373 261 to the present applicant discloses a fence panel wherein each pale is provided with one or more fixed lugs. The pales are passed through apertures in the rail, and rotated to locate the lugs in
5 recesses formed in internal surfaces of the rail. Angled bars are then inserted into a channel in the rail to lock the lugs in position. However, it can sometimes be difficult to hold all the pales in the correct position while the bar is inserted.

GB 2 345 303 to Mercian Security Fencing Limited discloses a fence panel made
10 from hollow, tubular pales which contain resilient pegs. The ends of each peg project through holes in the pale wall; during assembly, each pale is inserted into an aperture in the rail and rotated so that the peg ends spring into holes in internal surfaces of the rail, locking the pales in position. Similarly, US 5 873 564 to Bisch discloses a panel formed from hollow, tubular pales containing resilient pegs,
15 each pale being inserted through an aperture in one wall of the rail. As the pale is pushed towards the opposite wall of the rail, the peg end is urged into alignment with a hole in the pale wall, through which it springs out to lock the pale to the rail.

20 The use of hollow, tubular pales containing resiliently biased pegs facilitates the rapid and easy assembly of each panel. However, each pale must then be of sufficiently large external diameter, and sufficiently small wall thickness, to ensure adequate strength and rigidity while providing space for the resilient peg. This may be undesirable in some circumstances – for example, where it is desired
25 to use smaller diameter pales in order to maximise visibility through the panel or minimise its visual impact; or where pales of this type would have insufficient resistance to corrosion. The resilient pegs may also jam within the pale due to the accumulation of debris.

It is accordingly an object of the present invention to provide a self adjusting fence panel which it is easy to assemble on site but which overcomes the above disadvantages. It is a further object to provide a method of assembly for the panel.

- 5 According to a first aspect of the present invention there is provided a self adjusting fence panel, comprising a plurality of pales supported in spaced-apart parallel relationship by at least two rails, at least one rail having a plurality of apertures and each pale passing through an aperture; characterised in that the pales are formed from solid rod or bar, and in that each pale is attached to the at least
10 one rail by resiliently biased fastening means.

- According to a further aspect of the invention there is provided a method of assembling a solid pale self adjusting fence panel, the panel comprising a plurality of solid pales supported in spaced-apart parallel relationship by at least two rails,
15 at least one rail having a plurality of apertures and each pale passing through an aperture; each pale being provided with at least one bore, together with at least one lug slidably housed in the bore and urged outwardly therefrom by resilient biasing means, and the at least one rail being provided with a recess for receiving an outer end of the lug so as to secure the pale to the rail; characterised in the
20 steps of
- a) inserting the lug and biasing means into the bore;
 - b) sliding a sleeve over the pale so as to restrain the lug and biasing means in a retracted condition, and
 - c) inserting the pale into an aperture and sliding the sleeve towards the end of the
25 pale as the lugs pass into the rail.

Various embodiments of the invention will now be described by way of example and with reference to the accompanying drawings in which:

- 30 Fig. 1 is a perspective view of part of the upper rail of a self adjusting fence panel according to the invention;

Fig. 2A is an enlarged cross section at Y – Y through the rail and centre pale of Fig. 1 according to a first embodiment;

- 5 Fig. 2B is an enlarged longitudinal section through the pale and lugs of Fig. 2A;

Fig. 2C is an enlarged longitudinal section at X – X of the middle of the rail of Fig. 1 according to the first embodiment;

- 10 Fig. 3A shows the view of Fig. 2A according to a second embodiment; and

Fig. 3B shows the view of Fig. 2C according to the second embodiment.

- Corresponding parts are identified by the same reference numbers in each
15 embodiment.

- Referring to Fig. 1, a self adjusting fence panel comprises a plurality of solid pales 1, each passing through an aperture 2 in the upper wall 4 of an upper rail 3. The elongate form of each aperture 2 allows room for the rail to be tilted with respect
20 to the pales so that the panel can be adjusted during or after assembly so as to follow the slope of the ground, the pales and the ends of the panel remaining vertical. A lower rail (not shown) is spaced parallel to the rail 3 and may be of similar or different construction, the upper 3 and lower rails together supporting the pales 1 in spaced-apart parallel relationship. The panel in use is fastened at
25 each end of each rail to a vertical post embedded in the ground.

- Each pale 1 is formed from a solid bar or rod of steel or other suitable material, and is attached to the rail 3 by resiliently biased fastening means, which forms a pivot about which the pale 1 may be adjusted in angle with respect to the rail 3. It
30 will be noticed that the bottom of the rail forms an open channel allowing free adjustment of the angle between pales and rails. Similar angular adjustment is

provided at the lower rail, which conveniently includes similar apertures through which the pales pass; each pale may be similarly fixed to the lower rail or may merely be restrained from horizontal movement by the margin of the aperture through which it passes. Additional rails may be provided.

5

Referring to Figs. 2A – 2C, in a first embodiment the upper rail 3 comprises an upper wall 4, a pair of outer side walls 5 and a pair of inner return walls 6; conveniently, the rail is roll formed from steel. A pair of holes 7 form recesses in the inner return walls 6. Each recess 7 is positioned centrally beneath an aperture
10 2 and close to the upper wall 4 of the rail. A bore 8 is formed through the pale 1 and a pair of lugs 9 are slidably housed within the bore, and urged apart and outwardly from the pale by a resilient biasing means such as a spring 10. Each lug is provided at its inner end with a cavity 11 which receives one end of the spring. This enables the lugs to be compressed together so that their outer ends 12 are
15 substantially flush with the outer wall of the pale whilst their inner ends are abutting each other as shown in Fig. 2B.

The outer end portion 12 of each lug is formed with a reduced diameter, forming a shoulder 13 where it meets the inner end portion which contains the spring. In use,
20 the pale is inserted into the rail through one of the apertures 2, whereupon both lugs 9 and the spring 10 are retained in the compressed or retracted condition by contact with the inner return walls 6 of the rail. The pale is then pushed or rotated into position so that the reduced diameter end portion 12 of each lug passes through the corresponding hole 7 in the rail, and the shoulder 13 abuts the rail so
25 as to retain the lug partly within the bore and partly within the recess. This ensures that the pale is securely locked to the rail, the close fit of the pale 1 between the inner return walls 6 making it very difficult to access and manipulate the lugs 9 and so remove the pale without first severely damaging the rail. The fence is therefore quick and cost effective to erect, yet once assembled is secure against
30 unauthorised disassembly.

In order to retain the lugs 9 in the compressed condition as the pale is offered up to the rail, a sleeve (not shown) conforming to the outer profile of the pale may be slid over the pale to retain the lugs, then slid towards the end of the pale as the lugs pass into the rail. Outwardly sloped portions may be provided at opposite points on the circumference of the sleeve to receive the lugs and spring in the relaxed condition, the sleeve then being rotated or moved axially along the pale so as to urge them into the fully retracted condition. The lugs are then restrained in the fully retracted condition by one end of the sleeve, which abuts the upper wall 4 of the rail during assembly, being withdrawn afterwards over the end of the pale. The operation is repeated to assemble each pale into the rail, easing assembly and obviating the risk of repetitive strain injury for the workers carrying out the assembly. Of course, other methods of assembly may be used.

In summary, the self adjusting solid pale fence panel is assembled by resiliently biased fastening means such as pairs of spring loaded lugs which are slidably housed within a bore in each solid pale. The outer end of each lug is urged into a recess in an internal wall of the rail so as to form a pivot which locks the pale to the rail. The inner ends of the lugs have a cavity containing the spring. The panel may be assembled by sliding a sleeve over the pale so as to restrain the lugs, then withdrawing the sleeve as the pale passes into the rail. The rail may have an open base and inner return walls. Since the strength of a solid pale may be equivalent to that of a larger diameter hollow pale, smaller diameter, solid pales may be employed in order to improve visibility through the panel or to reduce its visual impact. Solid pales may also be used to extend the life of the fence in corrosive conditions.

Referring to Figs. 3A and 3B, in a second embodiment the lugs 9 are formed without the reduced diameter end portions or shoulders of the first embodiment. Instead, each recess 7 is formed by a tab which is stamped and pressed from the inner return wall 6 so as to form an integral end stop 14. In use, the outer end of

each lug 9 abuts the end stop 14 so as to retain the lug 9 partly within the bore and partly within the recess.

The bore may be a blind bore rather than a through bore, and one rather than a pair of lugs may be used. The lugs and biasing means may also be integral. In a development, each recess may be formed by a hole in the return wall 6, and a plug having a U shaped profile inserted in the return wall to provide an end stop. Alternatively, an insert may be pressed into the bore and retained by friction, and the lug slidably housed within the insert; a flange on the outer margin of the insert, or equivalent means, may cooperate with a shoulder on the lug or the like so as to restrain the lug partially within and partially projecting from the bore, obviating the need for an end stop or equivalent provision in the rail.

By using end stops, shoulders or equivalent retaining means to locate the lugs half in and half out of the pale, whilst locating the spring or equivalent biasing means within the lugs, it is possible to maximise the length of each lug and optimise the contact between each end of each lug and the bore or recess, and so to obtain a reliable fixing even in pales of relatively small diameter. This is particularly important in solid pale fences because the diameter of each pale is often smaller than that of a corresponding hollow, tubular pale. The diameter and length of the bore are therefore correspondingly restricted, which limits in turn the length of the or each lug and the configuration of the biasing means.

It would of course be possible to adjust the spacing between the outer side walls 5 and the inner return walls 6 so that each lug 9 abuts the inner face of an outer side wall 5 so as to retain it half in and half out of the bore. However, this would reduce the width and hence the strength and rigidity of the rail.

In a third embodiment, the fastening means comprises a resilient band which encircles the pale and engages with the rail so as to fasten the pale to the rail. The band may be formed from flat spring steel or from spring wire, and may have an

inwardly projecting portion which engages in a hole in the pale; alternatively it may embrace a reduced diameter section of the pale so that the outer diameter of the band is the same as that of the pale, ensuring that the pale is a tight fit in the apertures in the rail. Outwardly projecting portions may be formed on the band
5 which engage in recesses in an inner wall of the rail.

In a fourth embodiment, the pale is provided with at least one recess, such as a blind hole, and the rail is provided with at least one lug together with resilient biasing means which urges the lug out through a hole in the rail. The lug and
10 resilient biasing means may be integral, and formed for example by a serpentine spring clip made from steel wire which is inserted between the inner and outer walls 6 and 5 of the rail, with one end projecting through a hole in a similar position to the hole 7 of Fig. 2C. The pale is inserted through the aperture in the rail so that the end of the spring clip is forced back into the rail, then springs out
15 into the recess in the pale so as to fasten the pale to the rail.

By providing a rail with an open base and inner return walls, it is possible to maximise the security of the fence by preventing access to the fastening means, whilst obviating the need for large apertures in the base of the rail which may
20 pinch the fingers of the assembly workers when the panel is adjusted; it will be understood however that other forms of rail, such as hollow box section rails, may be used. The pales and rails may be made from steel or any other suitable material. Many further advantages and embodiments will become evident on studying the foregoing description and the attached drawings, and the invention is
25 not limited to the embodiments described herein.

CLAIMS

1. A self adjusting fence panel,
 - 5 comprising a plurality of pales supported in spaced-apart parallel relationship by at least two rails,

at least one rail having a plurality of apertures and each pale passing through an aperture;
10 characterised in that the pales are formed from solid rod or bar, and in that each pale is attached to the at least one rail by resiliently biased fastening means.
2. A self adjusting fence panel according to claim 1, characterised in that each
15 pale is provided with at least one bore, together with at least one lug slidably housed in the bore and urged outwardly therefrom by resilient biasing means; and the rail is provided with a recess for receiving an outer end of the lug so as to secure the pale to the rail.
- 20 3. A self adjusting fence panel according to claim 2, characterised in that the bore houses a pair of lugs which are urged apart by resilient biasing means arranged therebetween, and the rail is provided with a pair of recesses for receiving the outer ends of the lugs.
- 25 4. A self adjusting fence panel according to claim 3, characterised in that each lug has an inner end with a cavity, and the resilient biasing means is housed within the cavities such that the inner ends of the lugs may be compressed together into a mutually abutting relationship.

5. A self adjusting fence panel according to any of claims 2, 3 or 4, characterised in that the rail includes a pair of outer side walls and a pair of inner return walls, and each recess is formed in an inner return wall.
- 5 6. A self adjusting fence panel according to any of claims 2 – 5, characterised in that each recess is provided with an end stop, and in use the outer end of each lug abuts the end stop such that the lug is retained partly within the bore and partly within the recess.
- 10 7. A self adjusting fence panel according to any of claims 2 – 5, characterised in that each recess comprises a hole in the rail, and each lug is provided with a shoulder and a reduced diameter end portion; such that in use, the reduced diameter end portion passes through the hole in the rail, and the shoulder abuts the rail so as to retain the lug partly within the bore and partly within the recess.
- 15 8. A self adjusting fence panel according to claim 1, characterised in that the fastening means comprises a resilient band which encircles the pale and engages with the rail so as to fasten the pale to the rail.
- 20 9. A self adjusting fence panel according to claim 1, characterised in that the pale is provided with at least one recess and the rail is provided with at least one lug together with resilient biasing means; such that in use the lug is urged into the recess by the resilient biasing means so as to fasten the pale to the rail.
- 25 10. A self adjusting fence panel according to any preceding claim, characterised in that the fastening means forms a pivot whereabout the angle between the pale and the rail may be adjusted.
- 30 11. A self adjusting fence panel according to any preceding claim, characterised in that the panel once assembled is difficult to disassemble without damage to the panel.

12. A method of assembling a self adjusting fence panel,

5 the panel comprising a plurality of solid pales supported in spaced-apart parallel relationship by at least two rails, at least one rail having a plurality of apertures and each pale passing through an aperture;

each pale being provided with at least one bore, together with at least one lug slidably housed in the bore and urged outwardly therefrom by resilient biasing
10 means, and the at least one rail being provided with a recess for receiving an outer end of the lug so as to secure the pale to the rail;

characterised in the steps of

15 a) inserting the lug and biasing means into the bore;

b) sliding a sleeve over the pale so as to restrain the lug and biasing means in a retracted condition, and

20 c) inserting the pale into an aperture and sliding the sleeve towards the end of the pale as the lugs pass into the rail.

13. A self adjusting fence panel substantially as described herein with reference to the accompanying description and drawings.

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INVESTOR IN PEOPLE

Application No: GB 0223017.5
Claims searched: 1-13

Examiner: Nithi Nithiananthan
Date of search: 15 January 2003

Patents Act 1977 : Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance	
X, Y	X:1, 9-11 Y:8	US2218954	(Gustafson) Whole document
X, Y	X:1, 9-11 Y:8	US2218953	(Gustafson) Whole document
Y	Y:8	US4243343	(Wier) Figures

Categories.

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category	P	Document published on or after the declared priority date but before the filing date of this invention
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^v

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Worldwide search of patent documents classified in the following areas of the IPC⁷:

E04H

The following online and other databases have been used in the preparation of this search report:

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